

MONTANA DEPARTMENT OF ENVIROMENTAL QUALITY

Permitting and Compliance Division

Water Protection Bureau

P.O. Box 200901

Helena, Montana 59620-0901

Permit Fact Sheet

Montana Ground Water Pollution Control System (MGWPCS)

PERMITTEE: Ramshorn View Estates Subdivision Homeowners' Association

PERMIT NUMBER: MTX000103

RECEIVING WATER: Class I, Ground Water

FACILITY NAME: Ramshorn View Estates Subdivision

FACILITY LOCATION: South of Big Sky on the west side of Highway 191.

SOURCE LOCATION: North ½ of the Northeast ¼, Section 8, Township 7 South, Range 4 East, Gallatin County at 45 degrees, 14 minutes, 35 seconds North latitude and 11 degrees, 15 minutes, 15 seconds West longitude.

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Big Sky, Montana 59716
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FEE INFORMATION:

Number of Outfalls:	2
Type:	001 subsurface drainfield 002 subsurface drainfield

I. PERMIT STATUS

This statement of basis is for a permit renewal for Ramshorn View Estates Subdivision (RVES) pursuant to the Montana Ground Water Pollution Control System (MGWPCS). The MGWPCS permit for Ramshorn View Estates Subdivision (RVES) became effective on November 1, 1999 and expired on July 31, 2004. The Department received a MGWPCS GW-1 application on July 13, 2004, in accordance with ARM 17.30.1023 (3) and (4). This is a Level II wastewater treatment system [ARM 17.30.702(11)].

On August 16, 2004 a notice of deficiency was sent to the permittee requesting supplemental information [ARM 17.30.1023(5)] and an additional explanation regarding the current wastewater treatment system operation at RVES. The application was determined to be complete [ARM 17.30.1024(1)] on September 1, 2005. A minor modification transferring ownership [ARM 17.30.1362(1)(d)] from permittee from Homelands Development Company, LLC to the Ramshorn View Estates Subdivision Homeowners'

Association was received by the Department on March 9, 2006. This minor modification has been incorporated into the permit renewal.

A nondegradation significance review was completed on November 12, 1998 (Regensberger, 1998) and revised on April 9, 1999 (Regensberger, 1999) as part of the review process for the original permit and was determined to be nonsignificant. RVES received a Certificate of Subdivision Plat Approval (EQ#98-2631) for community drainfields #1, #2, and #3 on November 19, 1998. On May 25, 1999, the plans for community drainfield #1 were revised to include one (1) commercial lot, which is equivalent to 10 single-family homes. EQ#99-2364 reflects this revision.

This facility is subject to the Montana Nondegradation Policy (75-5-303, MCA) and Administrative Rules (ARM 17.30.701, et seq.). Based on the information provided in the permit renewal application (GW-1), no new or increased source of pollutants is proposed [ARM 17.30.702(18)]. Therefore, a nondegradation review is not necessary for the permit renewal at this time.

II. FACILITY INFORMATION

A. General

RVES is an existing subdivision permitted to discharge domestic wastewater from two (2) pressurized subsurface community drainfields at a rate greater than 5,000 gallons per day, each [ARM 17.30.1022(1)(c)]. These two separate discharges serve a total of 64 single family residences, and 1 commercial lot (equal to 10 single family residences). The first wastewater treatment system became operational during the second quarter of 2003. The second system became operational during the third quarter of 2005.

RVES is located south of Big Sky on the west side of Highway 191. Ramshorn View Estates Subdivision Homeowners' Association is the current permittee for Ramshorn View Estates Subdivision (RVES).

B. Wastewater Collection, Treatment, and Disposal

The wastewater treatment system is divided into two (2) separate units (see Attachment 1), Community System #1 (CS-1) and Community System #2 (CS-2). CS-1 is located in the north half of the subdivision and serves 38 residential lots, and 1 commercial lot (previously determined to be equivalent to 10 single-family homes). Primary wastewater treatment begins in individual residence septic tanks (1,500-gallon) with effluent filters where raw sewage is collected and settled. The septic tanks gravity feed into an 8-inch diameter sewer main, and wastewater is collected at a lift station. From the lift station, the wastewater is pumped into a series of two (2) recirculation tanks (10,414-gallon and 14,286-gallon). Wastewater enters a recirculating sand filter (RSF) from the recirculation tanks for Level II treatment. A 4,000-gallon dose tank pressure-doses the wastewater to a 385 feet by 280 feet, subsurface drainfield that discharges to the ground water.

CS-2 is located in the south-central portion of the subdivision and serves 26 residential lots. On each lot, raw sewage is collected and settled in individual (1,500-gallon) septic tanks with effluent filters on each lot. Wastewater from the septic tanks gravity feeds into an 8-inch diameter sewer main and collects at a lift station where it is pumped to four (4) recirculation tanks (3-4,000 gallon tanks and 1-2,000 gallon tank). From the recirculation tanks, the wastewater receives Level II treatment in a RSF. Treated effluent goes to

a 3,400-gallon dose tank, which pressure-doses the effluent to a subsurface drainfield (392 feet by 131 feet) that discharges to the ground water.

A design summary for Community Systems #1 and #2 is provided in Table 1.

Table 1: Ramshorn View Estates Subdivision - Design Information for Community Systems #1 and #2	
Construction Date: 1999	Modification Date:(transfer of ownership March 9, 2006)
Design Population: 64 single-family lots + 1 commercial lot	
Average Daily Flow (gpd): 14,800 = CS-1 is 9,600 + CS-2 is 5,200	
Disinfection (Y/N): No	
Disposal Method: Subsurface Drainfield	
Effluent Flow Meter(s): none, two totaling flow meters to be required in the permit renewal	
Sludge Pumping and Hauling: Licensed Septic Pumping Service	

The applicant has requested to discharge a total of 14,800 gallons per day (gpd). The average daily flow for CS-1 is 9,600 gpd. The average daily flow for CS-2 is 5,200 gpd. These flow rates were established in the original permit and will not change in the permit renewal.

As part of the general facility operations and maintenance plan, settled solids/sludge from the septic tanks, the recirculation tanks, and the RSF will be removed periodically as needed, no set maintenance schedule is proposed. The applicant will have a licensed septic pumping service to remove sludge and haul it to a permitted disposal facility.

III. DESCRIPTION OF THE DISCHARGE

A. Outfall Location

The permit renewal authorizes the permittee to discharge residential strength wastewater from two RSF treatment systems to subsurface drainfields (Outfall 001 and 002).

- Outfall 001 is located in the north portion of the subdivision (CS-1).
- Outfall 002 is located in the south-central portion of the subdivision (CS-2).

B. Past Monitoring Data/Effluent Characteristics

The original permit limits were based on total nitrogen (TN), which consists of nitrate +nitrite, as N and total Kjeldahl nitrogen (TKN). The previous permit limit for TN was 34 mg/L at each dose tank, separately. This limit was based on the median from the original nitrate sensitivity analysis (60 mg/L) and the maximum concentration observed by EPA for a single-family dwelling (100 mg/L). A 60% removal factor was applied to the median of 80 mg/L, for a total nitrogen (as N) concentration of 32 mg/L beneath the drainfield. The 7% removal attributable to the drainfield was calculated from the 32 mg/L and added to the concentration expected beneath the drainfield, to arrive at the original permit limit at each dose tank of 34 mg/L. This limit is partly a water quality-based limit with technology-based factors. The Department

no longer issues permits using a combination of water quality and technology-based limits but applies the more stringent limit (see Part IX of this Statement of Basis).

Effluent samples have been collected from the dose tank at each of the two community wastewater treatment systems, analyzed, and reported to the Department on a quarterly frequency. No flow rates were required to be reported and no load limits were established. Total phosphorous was not a required parameter to be monitored in the original permit. The concentration-based limit for nitrate (as N) at the boundaries of the two 500-foot standard ground water mixing zones was 5.0 mg/L in the original permit (see explanation in Part VI of this Statement of Basis).

The permittee has collected grab effluent samples on a quarterly frequency at the drainfield dose tank for CS-1 over a five-year period (20 samples) as a requirement of the permit. This analytical data is summarized in Table 2.

Table 2: Outfall 001 (CS-1) Effluent Characteristics ⁽¹⁾ for the POR April 1, 2003 to March 31, 2008.

Parameter	Location	Units	Previous Permit Limit	Minimum Value	Maximum Value	Average Value	Number Of Samples
Flow, Daily Average	Domestic Supply	gpd	(3)	(2)	(2)	(2)	0
Biochemical Oxygen Demand (BOD ₅)	Influent	mg/L	(3)	(2)	(2)	(2)	0
	Effluent	mg/L	(3)	(2)	(2)	(2)	0
Total Suspended Solids (TSS)	Influent	mg/L	(3)	(2)	(2)	(2)	0
	Effluent	mg/L	(3)	(2)	(2)	(2)	0
Escherichia coli (E. coli)	Effluent	No./100ml	(3)	(2)	(2)	(2)	(2)
pH	Effluent	s.u.	(3)	7.6	8.1	7.9	20
Specific Conductance	Influent	mg/L	(3)	(2)	(2)	(2)	0
	Effluent	μS/cm	(3)	766	1,380	1,183.9	20
Chloride	Effluent	mg/L	(3)	13	35	27.1	20
Ammonia, as N	Influent	mg/L	(3)	(2)	(2)	(2)	0
	Effluent	mg/L	(3)	(2)	(2)	(2)	0
Total Kjeldahl Nitrogen, as N (TKN)	Influent	mg/L	(3)	(2)	(2)	(2)	0
	Effluent	mg/L	(3)	<0.1	21.2	3.0	18
Nitrate + Nitrite, as N	Influent	mg/L	(3)	(2)	(2)	(2)	0
	Effluent	mg/L	(3)	0.8	21.9	13.4	20
Total Nitrogen (TN)	Influent	mg/L	(3)	(2)	(2)	(2)	0
		lbs/day	(3)	(2)	(2)	(2)	(2)
	Effluent	mg/L	34	10	22.4	16.1	20
		lbs/day	(3)	(2)	(2)	(2)	0
	Effluent	% removal	(3)	(2)	(2)	(2)	0
Total Phosphorus	Influent	mg/L	(3)	(2)	(2)	(2)	0
	Effluent	mg/L	(3)	(2)	(2)	(2)	0
		lbs/day	(3)	(2)	(2)	(2)	0
Total Dissolved Solids (TDS)	Effluent	mg/L	(3)	607	902	758.6	20

Footnotes:

(1) Conventional and nonconventional pollutants only, table does not include toxics.

(2) Data not available: no samples collected for this parameter.

(3) No limit in previous permit.

The permittee has collected grab effluent samples on a quarterly frequency at the drainfield dose tank for CS-2 over nearly a four-year period (11 samples) as a requirement of the permit. This analytical data is summarized in Table 3.

Table 3: Outfall 002 (CS-2) Effluent Characteristics⁽¹⁾ for the POR July 1, 2005 to March 31, 2008.

Parameter	Location	Units	Previous Permit Limit	Minimum Value	Maximum Value	Average Value	Number Of Samples
Flow, Daily Average	Domestic Supply	gpd	(3)	(2)	(2)	(2)	0
Biochemical Oxygen Demand (BOD ₅)	Influent	mg/L	(3)	(2)	(2)	(2)	0
	Effluent	mg/L	(3)	(2)	(2)	(2)	0
Total Suspended Solids (TSS)	Influent	mg/L	(3)	(2)	(2)	(2)	0
	Effluent	mg/L	(3)	(2)	(2)	(2)	0
Escherichia coli (E. coli)	Effluent	No./100ml	(3)	(2)	(2)	(2)	(2)
pH	Influent	s.u.	6 to 9	7.4	8.0	7.8	11
Specific Conductance	Influent	mg/L	(3)	(2)	(2)	(2)	0
	Effluent	μS/cm	(3)	1,080	1,500	1,348.2	11
Chloride	Effluent	mg/L	(3)	27	102	39.9	11
Ammonia, as N	Influent	mg/L	(3)	(2)	(2)	(2)	0
	Effluent	mg/L	(3)	(2)	(2)	(2)	0
Kjeldahl Nitrogen, as N	Influent	mg/L	(3)	(2)	(2)	(2)	0
	Effluent	mg/L	(3)	1.3	24.8	9.4	10
Nitrate + Nitrite, as N	Influent	mg/L	(3)	(2)	(2)	(2)	0
	Effluent	mg/L	(3)	7.75	46.9	16.0	10
Total Nitrogen (TN)	Influent	mg/L	(3)	(2)	(2)	(2)	0
		lbs/day	(3)	(2)	(2)	(2)	0
	Effluent	mg/L	34	12.7	46.9	23.1	11
		lbs/day	(3)	(2)	(2)	(2)	0
	Effluent	% removal	(3)	(2)	(2)	(2)	0
Total Phosphorus	Influent	mg/L	(3)	(2)	(2)	(2)	0
	Effluent	mg/L	(3)	(2)	(2)	(2)	0
		lbs/day	(3)	(2)	(2)	(2)	0
Total Dissolved Solids (TDS)	Effluent	mg/L	(3)	674	1040	848.5	11

Footnotes:

(1) Conventional and nonconventional pollutants only, table does not include toxics.

(2) Data not available: no samples collected for this parameter.

(3) No limit in previous permit.

According to 75-5-301(5)(d)(iii), MCA, changes in nitrate (as N) in the ground water are considered to be nonsignificant when the predicted concentration of nitrate (as N) at the boundary of the ground water mixing zone does not exceed 7.5 mg/L from raw sewage discharged from a system using Level II treatment, as defined in the following rule. ARM 17.30.702(11) states that Level II treatment means, the wastewater treatment system removes at least 60% of the total nitrogen (TN) as measured from the raw

sewage load to the system, or the system discharges a TN effluent concentration of 24 mg/L or less. A properly operated and maintained RSF is considered to provide Level II wastewater treatment.

C. Compliance History

A compliance evaluation inspection was conducted by the Department at the RVES on February 13, 2006. At the time of the inspection, the Department determined that this wastewater treatment facility has been operating in compliance with the requirements and effluent limits established in the existing MGWPCS discharge permit. Two shallow (the average depth to water is 16 feet below the top of the well casing) ground water monitoring wells have been sampled on a quarterly schedule. Nitrate + nitrite (as N) concentrations have been below the laboratory detection limit (<0.05 mg/L), except for the first quarter of 2005, when nitrate + nitrite (as N) was detected at 1.07 mg/L in MW1A.

IV. SITE CHARACTERISTICS

A. Soils

From east to west, soils grade from cobbly loam (Liberg) on 0 to 4% slopes, followed by loam and gravelly clay loam (Bridger) on 2 to 8% slopes, to loam and gravelly clay loam (Philipsburg –Liberg complex) on 4 to 8% slopes. The Bridger soils have a relatively higher clay content particularly from 8 to 28 inches deep, where soils are described as 35 to 50% clay.

B. Geology

Subsurface geologic deposits consist of Quaternary alluvium underlain by shale (Thermopolis) bedrock.

C. Hydrogeology

The depth to shallow ground water is 13 feet below ground surface (bgs) in the alluvial aquifer. Ground water flow in the area is based on three shallow test wells and has been determined to be to the N64°E. A total of four (4) test wells were drilled onsite in late 1997 and early 1998.

D. Hydrology

The hydraulic gradient (I) for the valley floor aquifer was determined using ground water level elevations from the three test wells. The hydraulic gradient is 0.0125 ft/ft. A hydraulic conductivity (K) of 1,115 ft/day was calculated for the valley floor alluvial aquifer based on pump test and recovery well data from Test Well T-2. These are the values used in the original permit and will be used in the permit renewal.

The Gallatin River is the nearest surface water to the subdivision. The river flows from the south to the north, and has been determined to be a gaining stream in the reach nearest RVES. Outfall 001 (CS-1) and Outfall 002 (CS-2) are approximately 1,000 feet west of the river.

V. RECEIVING WATER

A. Water-Use Classification and Applicable Water Quality Standards

In the original-revised (April 9, 1999) nondegradation nitrate sensitivity analysis review, a 1.09 mg/L nitrate (as N) concentration was used for the background ground water quality. However, the accompanying significance determination used 0.69 mg/L as the background nitrate (as N) concentration. This background/ambient nitrate + nitrite (as N) concentration was used in the original MGWPCS permit. The concentration value was based on a sample collected on 10/8/97, from an on-site test well (Test Well #T-2), which had a concentration of 0.69 mg/L.

The nitrate + nitrite (as N) concentrations in MW1A located at the end of the standard 500-foot mixing zone for the CS-1 community subsurface drainfield for 19 of the 20 sampling quarters submitted on Discharge Monitoring Report (DMR) forms to the Department were non-detect (i.e., <0.05 mg/L). A concentration of 1.07 mg/L of nitrate + nitrite (as N) was detected in the ground water in monitoring well MW1A during the first quarter of 2005. This appears to have been a sampling/analytical anomaly, because no detectable levels of nitrate + nitrite (as N) have been found since that sampling event.

The nitrate + nitrite (as N) concentrations in MW2A located at the end of the standard 500-foot mixing zone for the CS-2 community subsurface drainfield zone for all 11 sampling quarters submitted on Discharge Monitoring Report (DMR) forms to the Department were non-detect (i.e., <0.05 mg/L).

Therefore, the renewed permit will use the method detection/reporting limit of 0.05 mg/L of nitrate + nitrite (as N) as the ambient nitrate (as N) concentration in the shallow ground water.

Effluent is discharged from the wastewater treatment facility (Phase I and Phase II) to the ground water. 75-5-305(2), MCA states, that the Board shall establish minimum requirements for the control and disposal of sewage from private and public buildings. Applicable water quality standards for individual parameters of concern are established according to the receiving ground water classification based on specific conductivity in umhos/cm or microSiemens/cm.

The ground water monitoring data collected from monitoring well (MW1A) located at the end of the standard, 500-foot ground water mixing zone for CS-1 indicates Class I ground water based on the average specific conductivity of 276 μ mhos/cm from 19 quarterly samples collected from MW1A). The ground water monitoring data collected from monitoring well (MW2A) located at the end of the standard, 500-foot ground water mixing zone for CS-2 indicates Class I ground water based on the average specific conductivity of 240 μ mhos/cm from 11 quarterly samples collected from MW2A (see Table 4).

Table 4. Local Shallow Ground Water Characteristics

Parameter, units	Average Value	Minimum Value	Maximum Value	Number of Samples	Source of Data
Specific Conductance, $\mu\text{mhos/cm}$	263	196	1,090	30	MW1A, MW2A
Total Dissolved Solids, mg/L	129.6	88	609	30	MW1A, MW2A
pH, s.u.	7.6	7.0	8.4	29	MW1A, MW2A
Chloride, mg/L	7.6	4	9	30	MW1A, MW2A
Fecal Coliform, #/100ml	<1	<1	<1	30	MW1A, MW2A
Nitrate + Nitrite (as N), mg/L	0.09	<0.05	1.07	30	MW1A, MW2A
Ammonia (as N), mg/L	0.15	<0.1	0.6	30	MW1A, MW2A

According to ARM 17.30.1006 (Classifications, Beneficial Uses and Specific Standards for Groundwaters), the receiving water for Outfall 001 and 002 is Class I ground water. Class I ground water has a specific conductivity of less than or equal to 1,000 $\mu\text{mhos/cm}$ at 25 degrees Centigrade, as defined by ARM 17.30.1006(1). According to ARM 17.30.1006(1)(a), the quality of Class I groundwater must be maintained so that these waters are suitable for public and private water supplies, culinary and food processing, irrigation, commercial and industrial purposes, drinking water for livestock and wildlife, with little or no treatment. Human health standards listed in DEQ Circular 7 (February 2006) apply to concentrations of dissolved substances in Class I ground waters.

Montana's nondegradation policy (75-5-303, MCA) applies to any activity of man resulting in a new or increased source which may cause degradation [ARM 17.30.705(1)]. The applicant must demonstrate that existing uses of state waters and the level of water quality necessary to protect those uses will be maintained. Compliance for permitting purposes is accomplished through a significance determination by the Department. A determination of nonsignificant changes in water quality is based on the criteria set forth in ARM 17.30.715 regarding flow volume, carcinogenic parameters, toxic parameters, nitrate and phosphorous concentrations, harmful parameters, and parameters for which there are only narrative water quality standards.

The applicable ground water quality standards and nondegradation significance criteria for the permit renewal are included in Table 5.

Table 5. Applicable Water Quality Standards and Nondegradation Significance Criteria

Parameter, units	DEQ Circular 7 Human Health Ground Water Standards	Nondegradation Significance Criteria for Level II Treatment in Ground Water
Nitrate (as N), mg/L	10	7.5
Total Inorganic Phosphorus, mg/L	no standard	50 year breakthrough ⁽¹⁾
E-Coli Bacteria, organisms/100 ml	<1	<1

(1) The phosphorus significance criteria is listed in ARM 17.30.715(1)(e): "changes in concentration of total inorganic phosphorus in ground water if water quality protection practices approved by the department have been fully implemented and if an evaluation of the phosphorus adsorptive capacity of the soils in the area of the activity indicates that phosphorus will be removed for a period of 50 years prior to a discharge to any surface waters."

Site-specific ground water conditions were evaluated in the original permit development. Ground water monitoring at the facility has revealed that nondegradation water quality standards have not been exceeded for CS-1 at MW1A or CS-2 at MW2A. A nondegradation review is not necessary for the permit renewal at this time (see the explanation in Part I of this Statement of Basis).

VI. MIXING ZONE

A mixing zone, as defined in 75-5-103(18), “means an area established in a permit or final decision on nondegradation issued by the Department where water quality standards may be exceeded, subject to conditions that are imposed by the Department and that are consistent with the rules adopted by the Board.” Requirements for granting a mixing zone are based on 75-5-301(4), MCA, which states that mixing zones must: (a) be the smallest practicable size, (b) have a minimum practicable effect on water uses, and (c) have definable boundaries. The Department has adopted rules implementing the nondegradation policy established in 75-5-303, MCA to provide that changes in nitrate (as N) in the ground water are nonsignificant if the discharge will not cause degradation of surface water and the predicted concentration of nitrate (as N) at the boundary of the ground water mixing zone does not exceed limits as specified in 75-5-301(5)(d), MCA.

The permittee must comply with the ground water mixing zone rules pursuant to ARM Title 17, Chapter 30, Subchapter 5. The Department shall assess the information received from the applicant concerning the biological, chemical, and physical characteristics of the receiving water as specified in ARM 17.30.506 or as requested by the Department. The Department will determine the applicability of a mixing zone, as well as the size, configuration, and location [see ARM 17.30.505(1)].

To qualify for a standard ground water mixing zone [ARM 17.30.517(1)(c)], the concentration(s) of the pollutants at the hydraulically downgradient boundary of the mixing zone discharge must meet the nonsignificance criteria, as specified in ARM 17.30.715. Concentration-based limits for nitrate (as N) in the ground water at the boundary of any applicable mixing zone are established according to levels of wastewater treatment [75-5-301(5)(d)(iii), MCA and ARM 17.30.702] (also, see Part III.B. of this statement of basis).

The permittee has been discharging all wastewater from Outfall 001 and 002 and has requested the permit renewal be for the previously granted two (2) standard, 500-foot ground water mixing zones (ARM 17.30.517) for drainfields CS-1 and CS-2 (Attachment 1). The permittee must comply with the ground water mixing zone rules pursuant to ARM Title 17 Chapter 30 Subchapter 5. The shape of the each mixing zone is determined using the drainfield dimensions and information on water table elevations and topography.

The shallow ground water flow direction is N64°E, and the hydraulic gradient is 0.0125 ft/ft (see part IV.D of this statement of basis for details).

The width of the drainfield, perpendicular to the direction of ground water flow for CS-1 is 475 feet. The width of the drainfield, perpendicular to the direction of ground water flow for CS-2 is 475. A standard 500-foot ground water mixing zone has been granted for an individual parameter of nitrate (as N) [ARM 17.30.505(1)(a)] for each mixing zone. The original mixing zones will remain the same.

The original permit limit for nitrate (as N) at the end of each standard mixing zone was 5.0 mg/L nitrate (as N). However, since these wastewater treatment systems provide Level II treatment, the permit renewal

limit for nitrate (as N) in the ground water at the hydraulically downgradient boundary of each of the two standard 500-foot mixing zones boundaries (i.e., in the ground water sampled at each monitoring well) is 7.5 mg/L [ARM 17.30.715(1)(d)(iii)].

The current ambient nitrate + nitrite (as N) concentration in the shallow ground water is less than 0.05 mg/L (see Part V of this statement of basis). The concentration of pollutants has been estimated based on a mass balance calculation at the downgradient boundary of the two standard 500-foot ground water mixing zones. The Department is granting these mixing zones for nitrate (as N).

No mixing zone will be granted if it would threaten or impair existing beneficial uses [ARM 17.30.506(1)]. DEQ Circular 7 (February, 2006) human health-based ground water standards must not be exceeded beyond the boundaries of a mixing zone [ARM 17.30.1005(2) and ARM 17.30.508(1)(a)]. In addition, the zone of influence of any drinking water well will not be allowed to intercept a ground water mixing zone [ARM 17.30.508(2)].

VII. EFFLUENT LIMITS AND CONDITIONS

A. Scope and Authority

The Montana Water Quality Act (Act) states that it is unlawful to discharge sewage, industrial waste or other wastes into any state water without a current permit from the Department (75-5-605(2), MCA). The Act also sets forth duties of the Department that shall include the following: issue, suspend, revoke, modify, or deny permits 401(1), MCA; examine information in order to issue a permit or issue a permit with conditions 401(2), MCA; and specify limitations in the permit 401(3), MCA. The Act also establishes that rules shall be adopted governing the application, authorization and issuance of permits to discharge sewage, industrial wastes or other wastes to state waters, provided the limitation of said permits will not result in pollution of any state waters.

B. Proposed Effluent Limits

ARM 17.30.1031 states that all issued MGWPCS permits must contain conditions including, but not limited to, discharge limitations, which will assure compliance with the ground water standards given due consideration to the economics of waste treatment and prevention. ARM 17.30.1005(1) states, the standards in ARM 17.30.1006 establish the maximum allowable changes in ground water quality and are the basis for limiting discharges to ground water.

1. Total Nitrogen

Data show recirculating sand filter (RSF) wastewater treatment systems produce a high quality effluent, and are considered to be a Level II treatment according to ARM 17.30.702(11). A Level II system must provide at least a 60 percent removal of total nitrogen (TN) in the raw wastewater or an effluent TN concentration of 24 mg/L or less beneath the drainfield [ARM 17.30.702(11)]. The Department has established that a properly installed, operated and maintained RSF wastewater treatment system meets the definition of a Level II system.

Based on the performance of the system, the technology-based effluent concentration limits (TBELs) for TN are set forth in Table 6 and Table 7. These limits are applicable to effluent samples collected at each dose tank prior to discharge to each outfall (i.e., subsurface drainfield).

Table 6. Technology-Based Effluent Limits for Outfall 001

Parameter	Daily Maximum Concentration ⁽¹⁾ mg/L per Outfall	90-Day Average Load ⁽¹⁾ (pounds per day)
Total Nitrogen, as N (TN) ⁽²⁾	26	2.08 ⁽³⁾
Total Phosphorus, as P (TP)	NA	0.85

(1) See definitions in Part V of this permit.

(2) Total Nitrogen (TN) is the sum of nitrate + nitrite (as N) and total Kjeldahl nitrogen (as N).

(3) When the WQBEL concentration is greater than 26 mg/L TN, 26 mg/L is used in the calculation of the load limit.

NA Not Applicable

Table 7. Technology-Based Effluent Limits for Outfall 002

Parameter	Daily Maximum Concentration ⁽¹⁾ mg/L per Outfall	90-Day Average Load ⁽¹⁾ (pounds per day)
Total Nitrogen, as N (TN) ⁽²⁾	26	1.13 ⁽³⁾
Total Phosphorus, as P (TP)	NA	0.46

(4) See definitions in Part V of this permit.

(5) Total Nitrogen (TN) is the sum of nitrate + nitrite (as N) and total Kjeldahl nitrogen (as N).

(6) When the WQBEL concentration is greater than 26 mg/L TN, 26 mg/L is used in the calculation of the load limit.

NA Not Applicable

An additional 7% of nitrogen removal via natural treatment occurs within the drainfield and beneath the drainfield in the unsaturated soils (MDEQ, March, 2005), providing the final TN concentration discharged to ground water (i.e., 24 mg/L for a Level II treatment system).

VIII. WATER QUALITY-BASED EFFLUENT LIMITS

The Montana Water Quality Act states, it is unlawful to discharge sewage, industrial wastes, or other wastes into any state waters (75-5-605(1)(c), MCA). The Act requires that a discharge to state waters shall not cause a violation of water quality standards (75-5-605(1)(a), MCA). Water quality limitations must be established in permits (75-5-605(1)(b), MCA) to control all pollutants or pollutant parameters that are or may be discharged at a level which will cause, have reasonable potential to cause or contribute to an excursion above any state water quality standard. The permittee must comply with Montana Numeric Water Quality Standards set forth in MDEQ Circular 7 (February 2006) and the protection of beneficial uses (ARM 17.30.1006).

Permits are required to include water-quality based effluent limits (WQBEL) when technology-based effluent limits are not adequate to protect state water quality standards (40 CFR 122.44 and ARM 17.30.1344). Montana water quality standards (ARM 17.30.10 et seq.) define both ground water use classifications for all state waters and numeric and narrative standards that protect those designated uses. New sources, as defined in ARM 17.30.702(18), are subject to Montana Nondegradation Policy (75-5-303, MCA) and regulations (ARM 17.30.701 et. seq).

A. Nitrate

The Class I ground water is considered high quality water and is subject to Montana's Nondegradation Policy (75-5-303, MCA). The applicable ground water standard is based on nondegradation, with a nitrate (as N) concentration limit of 7.5 mg/L [ARM 17.30.715(1)(d)(iii)] at the end of the standard 500-foot

ground water mixing zone.

The total nitrogen (TN) concentration is the sum of nitrate plus nitrite, as nitrogen (N) plus Total Kjeldahl Nitrogen (as N) [TKN]. TKN is the sum of ammonia and organic nitrogen components. Raw wastewater consists primarily of ammonia. Treatment in septic tanks and drainfield convert the ammonia to nitrite and nitrate, as N. Sand filters, trickling filters, and aerobic treatment units, as well as unsaturated zone material beneath the drainfields, convert the organic N (TKN) to nitrate, (as N). The Department assumes all of the nitrogen in the effluent discharged to the drainfield has been converted to nitrate, (as N) [MDEQ, 2005]. The allowable discharge concentration is derived from the mass balance water quality equation [ARM 17.30.517(1)(d)], which considers dilution and the background concentration of the receiving water (EPA, 2000).

The allowable discharge concentration beneath the CS-1 drainfield (Outfall 001) is:

$$C_2 = \frac{C_3(Q_1 + Q_2) - C_1 Q_1}{Q_2}$$

$$C_2 = 690 \text{ mg/L}$$

- C_1 = ambient ground water (background) concentration, is 0.05 mg/L
- C_2 = allowable discharge concentration beneath the drainfield
- C_3 = ground water concentration limit for pollutant (from Circular WQB-7 or other appropriate water quality standard) at the end of the mixing zone is 7.5 mg/L
- Q_1 = ground water volume is 117,597.66 ft³/day
- Q_2 = maximum flow of discharge (average daily flow of system is 1,283.42 ft³/day)

For the CS-1 wastewater treatment system, the volume of ground water that will mix with the discharge (Q_1) is estimated using Darcy's equation: $Q_1 = K I A$. The calculated value of Q_1 is 117,597.66 ft³/day for the mixing zone; assuming an aquifer K value of 1,115 ft/day, an average measured gradient of 0.0125 ft/ft, and a cross sectional area of flow at the downgradient boundary of the standard, 500-foot mixing zone of 8,437.50 ft².

The average daily flow of the CS-1 wastewater disposal system is 9,600 gpd, or 1,283 ft³/day. The nitrate plus nitrite (as N) concentration must not exceed 7.5 mg/L at the boundaries of each mixing zone (CS-1 and CS-2). The ambient concentration of nitrate-nitrogen in the ground water is 0.05 mg/L (C_1). It is assumed that the entire TN load in the effluent converts to nitrate and enters the ground water.

As discussed in Part VII, nitrate reduction of approximately 7 percent is assumed to occur beneath the CS-1 drainfield. Therefore, to discharge a TN concentration of 690 mg/L below the drainfield, the effluent limit from the RSF system at the dose tank prior to discharge to the subsurface drainfields is calculated at 738.3 mg/L of TN.

690 mg/L (.07) = 48.3 mg/L Assumed nitrate reduction beneath the drainfield.
690 mg/L + 48.3 mg/L = 738.3 mg/L Maximum concentration of TN at the dose tank, prior to discharge to the subsurface drainfield (Outfall 001).

The calculated effluent concentration of TN must not exceed 738.3 mg/L at the daily flow in order to maintain a concentration that is less than the state water quality standard of 7.5 mg/L for nitrate plus nitrite (as N) in the ground water at the mixing zone (Part VI) boundary. The WQBEL will be expressed as a load

(lbs/day) based on the average daily flow of the system (9,600 gpd) and the calculated maximum concentration as follows:

Load limit (lbs/day) per outfall = effluent flow rate (gpd) x daily maximum concentration (mg/L) x (8.34×10^{-6})
Load limit (lbs/day) per outfall = (9,600 gpd) x (738.3 mg/L) x (8.34×10^{-6})
Load limit (lbs/day) per outfall = 59.11 lbs/day

The allowable discharge concentration beneath the CS-2 drainfield (Outfall 002) is:

$$C_2 = \frac{C_3(Q_1 + Q_2) - C_1 Q_1}{Q_2}$$

$$C_2 = 1,268 \text{ mg/L}$$

C_1 = ambient ground water (background) concentration, is 0.05 mg/L
 C_2 = allowable discharge concentration beneath the drainfield
 C_3 = ground water concentration limit for pollutant (from DEQ Circular 7 or other appropriate water quality standard) at the end of the mixing zone is 7.5 mg/L
 Q_1 = ground water volume is 117,597.66 ft³ / day
 Q_2 = maximum flow of discharge (average daily flow of system is 695.19 ft³ / day)

For the CS-2 wastewater treatment system, the volume of ground water that will mix with the discharge (Q_1) is estimated using Darcy's equation: $Q_1 = K I A$. The calculated value of Q_1 is 117,597.66 ft³/day for the mixing zone; assuming an aquifer K value of 1,115 ft/day, an average measured gradient of 0.0125 ft/ft, and a cross sectional area of flow at the downgradient boundary of the standard, 500-foot mixing zone of 8,437.50 ft².

The average daily flow of the CS-2 wastewater disposal system is 5,200 gpd, or 695.19 ft³/day. The nitrate plus nitrite (as N) concentration must not exceed 7.5 mg/L at the boundaries of each mixing zone (CS-1 and CS-2). The ambient concentration of nitrate-nitrogen in the ground water is 0.05 mg/L (C_1). It is assumed that the entire TN load in the effluent converts to nitrate and enters the ground water.

As discussed in Part VII, nitrate reduction of approximately 7 percent is assumed to occur beneath the CS-2 drainfield. Therefore, to discharge a TN concentration of 1,268 mg/L below the drainfield, the effluent limit from the RSF system at the dose tank prior to discharge to the subsurface drainfields is calculated at 1,356.76 mg/L of TN.

1,268 mg/L (.07) = 88.76 mg/L Assumed nitrate reduction beneath the drainfield.
1,268 mg/L + 88.76 mg/L = 1,356.76 mg/L Maximum concentration of TN at the dose tank, prior to discharge to the subsurface drainfield (Outfall 001).

The calculated effluent concentration of TN must not exceed 1,356.76 mg/L at the daily flow in order to maintain a concentration that is less than the state water quality standard of 7.5 mg/L for nitrate plus nitrite (as N) in the ground water at the mixing zone (Part VI) boundary. The WQBEL will be expressed as a load (lbs/day) based on the average daily flow of the system (5,200 gpd) and the calculated maximum concentration as follows:

Load limit (lbs/day) per outfall = effluent flow rate (gpd) x daily maximum concentration (mg/L) x (8.34×10^{-6})
Load limit (lbs/day) per outfall = (5,200 gpd) x (1,356.76 mg/L) x (8.34×10^{-6})

Load limit (lbs/day) per outfall= 58.84 lbs/day

The WQBELs are summarized in Table 8 for Outfall 001 and Table 9 for Outfall 002.

Based on the above calculations, the alluvial sand and gravel, the high hydraulic conductivities, and the great amount of dilution provided by the shallow aquifer in this area, there is adequate dilution after mixing to meet the applicable nondegradation limit of 7.5 mg/L at the boundaries of each standard, 500-foot mixing zone (CS-1 and CS-2). The effluent nitrogen concentrations would need to be greater than 690 and 1,268 mg/L to create an exceedance of water quality-based limits at the boundary of the mixing zones for CS-1 and CS-2, respectively.

B. Phosphorus

A concentration of 10.6 mg/L of total phosphorous (TP) is consistent with the concentration found in residential wastewater. Therefore, the estimated load using the design capacity flow rate for from Outfall 001 is 0.85 pounds per day (lbs/day). The estimated load from Outfall 002 is 0.46 lbs/day.

More precisely, phosphorus is removed mainly through soil sorption processes, which are slow and vary based on soil composition. The TP limitations are imposed to ensure that the quality of the effluent meets the nondegradation significance criteria prior to discharge into any surface water [ARM 17.30.715(1)(e)]. The effluent limits do not include a concentration limit for phosphorus because of the method used to determine compliance with the 50-year breakthrough analysis. The 50-year breakthrough nondegradation criterion is based on the amount of soil available to adsorb the phosphorus between the discharge point and the surface water using the average load of phosphorus from the wastewater source. Total phosphorus of 10.6 mg/L is consistent with the concentration found in residential wastewater.

Based on the local ground water flow direction of N64°E, the nearest hydraulically downgradient receiving surface water is the Gallatin River, which has been determined to be a gaining stream in this area. According to the nondegradation review completed by the Department on November 12, 1999 and revised on April 9, 1999, the discharges are considered to be nonsignificant pursuant to the criteria of ARM 17.30.715(1)(e).

For the permit renewal, a current phosphorous breakthrough analysis shows the breakthrough time to the nearest downgradient receiving surface water (Gallatin River) from Outfall 001 is 141 years. A current phosphorous breakthrough from Outfall 002 is 159 years. Therefore, the discharge from these outfalls is considered nonsignificant degradation pursuant to the criteria of ARM 17.30.715(1)(e). The effluent limit for the TP load discharged to Outfall 001 is 309 lbs/yr or 0.85 lbs/day and for Outfall 002 the TP load limit in the effluent is 167 lbs/yr or 0.46 lbs/day.

C. E- Coli Bacteria

The Department is not granting a mixing zone for E-coli bacteria because a properly sited and operated drainfield should remove most, if not all, of the pathogenic bacterial indicators within 2 to 3 feet of the drainfield's infiltrative surface (USEPA, 2002). The E-coli water quality standard is <1 organism per 100 ml in the ground water (DEQ Circular 7, 2/2006). Based on the following site-specific criteria, ground water monitoring for E-coli bacteria at the hydraulically downgradient edge of the subsurface drainfields will not be required at this time.

- Ground water samples collected from the two onsite shallow ground water monitoring wells located at the hydraulically downgradient boundary of each of the two mixing zones were analyzed for fecal coliform bacteria on a quarterly frequency within activation of each wastewater treatment system. Less than 1 organism per 100 ml (non-detect) was measured in all of the monitoring well samples to date. The permit renewal shall require quarterly sampling and analysis for E-coli bacteria at each ground water monitoring well at the end of the standard 500-foot mixing zones.
- The fine-grained sediments in the unsaturated alluvium beneath the drainfields should continue to promote natural disinfection.
- See the original statement of basis (Byron, 1999) for additional points.

The systematic pressure-dosing of the drainfields will minimize saturated conditions and maximize the die-off rate in the natural sediments. The subsurface drainfields will discharge effluent approximately 2 to 4 feet below the ground surface. This provides between 9 and 11 feet of unsaturated subsoil-sediments where treatment may occur naturally before discharging to the ground water.

In the event an E-coli bacteria concentration is detected above the water quality standard (less than 1 organism per 100 ml) in either of the ground water monitoring wells located at the hydraulically downgradient boundary of the mixing zone for each outfall, the exceedance shall be verified by timely (72-hour) re-sampling. A validated E-coli exceedance confirming the presence of E-coli bacteria in the ground water will require at least one additional monitoring well to be drilled. This well(s) must be drilled and completed at the hydraulically downgradient edge of the drainfield from which the bacterial release had occurred (i.e., the impacted ground water monitoring well). Disinfection may be required to be added to the wastewater treatment system.

D. BOD₅ and TSS

BOD₅ and TSS are monitored for wastewater treatment system efficiency to ensure the effective removal of biological material and that the proper aerobic biological processes are being maintained. There are no numeric ground water quality standards for BOD and TSS, however according to ARM 17.30.1006(1)(b)(ii) the beneficial uses for a Class I ground water must be maintained. BOD and TSS are not subject to nondegradation unless they have a reasonable potential to affect a beneficial use based on the significance criteria for BOD and TSS, which are narrative [ARM 17.30.715 (1)(g) and DEQ Circular 7].

Table 8. Water Quality-Based Effluent Limits for Outfall 001 (at the dose tank prior to discharge to the subsurface drainfields)

Parameter	Daily Maximum ⁽¹⁾ Concentration (mg/L)	90-Day Average Load ⁽¹⁾ (pounds per day)
Total Nitrogen, as N [TN]	690	59.11
Total Phosphorus, as P [TP]	NA	0.85

(1) See definitions, Part V of the permit
NA Not Applicable

Table 9. Water Quality-Based Effluent Limits for Outfall 002 (at the dose tank prior to discharge to the subsurface drainfields)

Parameter	Daily Maximum ⁽¹⁾ Concentration (mg/L)	90-Day Average Load ⁽¹⁾ (pounds per day)
Total Nitrogen, as N [TN]	1,268	58.84
Total Phosphorus, as P [TP]	NA	0.46

(1) See definitions, Part V of the permit
NA Not Applicable

IX. FINAL EFFLUENT LIMITS

The proposed effluent limitations for Outfall 001 and Outfall 002 are summarized in Table 10 and Table 11, respectively. These limits are based on the more restrictive of the technology and water quality based criteria discussed in previous sections. The final proposed effluent concentration limit for TN is related to the expected performance of the RSF systems and the subsurface drainfields with proper operation and maintenance. The concentration limit is proposed to ensure the systems operate at the level II requirement with an effluent concentration of TN at Outfall 001 and Outfall 002 (separately), not to exceed 24 mg/L, as specified in ARM 17.30.702(11).

The nitrate sensitivity calculation provides the concentration-based limit that ensures the concentration of nitrate (as N) in the ground water at the hydraulically downgradient boundary of the standard 500-foot mixing zone will not exceed 7.5 mg/L [75-5-301(5)(d), MCA and ARM 17.30.715(1)(d)(iii)].

The effluent limit for TP is water quality-based as determined according to nondegradation significance criteria. The water quality-based effluent load limit considers the assimilative capacity of the soil system to estimate the maximum load of phosphorus discharged to the ground water without exceeding the 50-year breakthrough. The 90-day/quarterly average load limit will provide protection for the surface and ground water quality.

The effluent limits in Table 9 apply to the treated effluent at the dose tank prior to discharge to the drainfield/Outfall 001 as shown in Attachment 1.

Table 10. Numeric Effluent Limits for Outfall 001

Parameter	Daily Maximum Concentration ⁽¹⁾ (mg/L) per Outfall	90-Day Average Load ⁽¹⁾ (pounds per day) per Outfall
Total Nitrogen, as N (TN) ⁽²⁾	26	2.08 ⁽³⁾
Total Phosphorus, as P (TP)	NA	0.85

(1) See definitions, Part V of the permit.

(2) Total Nitrogen (TN) is the sum of nitrate + nitrite (as N) and total Kjeldahl nitrogen (as N).

(3) When the WQBEL concentration is greater than 26 mg/L TN, 26 mg/L is used in the calculation of the load limit.

NA Not Applicable

Other Discharge Limitations:

The average daily flow rate of effluent discharged to Outfall 001 shall not exceed 9,600 gpd.

The effluent limits in Table 10 apply to the treated effluent at the dose tank prior to discharge to the drainfield/Outfall 002 as shown in Attachment 1.

Table 11. Numeric Effluent Limits for Outfall 002

Parameter	Daily Maximum Concentration⁽¹⁾ (mg/L) per Outfall	90-Day Average Load⁽¹⁾ (pounds per day) per Outfall
Total Nitrogen, as N (TN) ⁽²⁾	26	1.13 ⁽³⁾
Total Phosphorus, as P (TP)	NA	0.46

(1) See definitions, Part V of the permit.

(2) Total Nitrogen (TN) is the sum of nitrate + nitrite (as N) and total Kjeldahl nitrogen (as N).

(3) When the WQBEL concentration is greater than 26 mg/L TN, 26 mg/L is used in the calculation of the load limit.

NA Not Applicable

The average daily flow rate of effluent discharged to Outfall 002 shall not exceed the design capacity of 5,200 gpd.

X. MONITORING REQUIREMENTS

A. Influent Monitoring

No influent monitoring will be required.

B. Effluent Monitoring

Effluent monitoring is essential to ensure the effective treatment and consistency of the wastewater discharged from the facility. The effluent limits are established to protect the ground water from a change in water quality that would cause degradation [ARM 17.30.715], cause a change in beneficial use [ARM 17.30.1006(1)(a)], or cause a violation of water quality standards. Samples or measurements shall be representative of the volume and nature of the monitored discharge at each outfall, separately.

The Department shall require effluent sampling using specified monitoring methods at designated locations and intervals (75-5-602(4), MCA). Effluent monitoring/sampling shall be conducted by collecting a separate composite sample from each of the wastewater treatment systems' dose tank that is representative of the discharge prior to discharging to the subsurface drainfields (Outfall 001 and Outfall 002). Individual composite samples collected from each dose tank, separately shall be submitted to the laboratory for analyses of all of the parameters in Table 12.

The permittee shall monitor the effluent to be discharged at Outfall 001 and Outfall 002 (separate samples for each outfall) for the parameters in Table 12. These samples shall be collected at the frequency and with the type of measurement and sampling as indicated in Table 12 [ARM 17.30.1031(5)]. It is the responsibility of the permittee to establish and maintain records of all monitoring (75-5-602(1), MCA), and make reports (DMRs) of the required data to the Department (75-5-602(2), MCA). If no discharge occurs during the entire monitoring period, it shall be stated in a Discharge Monitoring Report (DMR) that "no discharge" occurred.

**Table 12. Parameters To Be Monitored in the Effluent for Outfall 001 and Outfall 002
(at each dose tank, separately)**

Parameter, units	Frequency	Sample Type ⁽¹⁾
Effluent Flow Rate, gpd ⁽²⁾	Quarterly	Continuous ⁽¹⁾
Total Suspended Solids (TSS), mg/L	Quarterly	Composite
Biological Oxygen Demand (BOD ₅), mg/L	Quarterly	Composite
Total Kjeldahl Nitrogen (TKN), mg/L	Quarterly	Composite
NO ₃ +NO ₂ as N, mg/L	Quarterly	Composite
Total Phosphorus (as P), mg/L	Quarterly	Composite
Total Nitrogen (as N), mg/L	Quarterly	Calculated
Total Nitrogen (as N), lb/d	Quarterly	Calculated
Total Phosphorus (as P), lb/d	Quarterly	Calculated

(1) See definitions, Part V of the permit

(2) If no discharge occurs during the reporting period, “no discharge” shall be recorded on the DMR report form

The 90-day average load for TN and TP are the sum of the calculated loads for each TN and TP sample collected within the 90-day period, divided by the number of samples collected and analyzed for TN and TP.

The permittee shall install, use, and maintain monitoring equipment or methods (75-5-602(3), MCA). The effluent flow measurement method shall be measured with totalizing flow meters (one per outfall); dose counts or pump run-times will not be accepted for wastewater systems undergoing permit renewal. The permittee shall monitor the flow of the effluent between the dose tank and the drainfield for each wastewater treatment facility (CS-1/Outfall 001 and CS-2/Outfall 002). The permittee shall report the flows for Outfall 001 and Outfall 002 separately, based on the average gallons per day (gpd) for each quarter for each outfall. The permittee has provided a map of the proposed flow meter locations for each wastewater treatment system in the October 11, 2004 supplemental information submittal.

C. Ground Water Monitoring

ARM 17.30.505(1)(e) states, “estimated parameter levels in the mixing zone area will be calculated, unless the Department determines that monitoring is necessary due to the potential harm to the impacted water and its beneficial uses.” To ensure compliance with applicable water quality standards and beneficial uses at the end of the standard 500-foot ground water mixing zones, monitoring may be required [ARM 17.30.517(1)(d)(ix)].

In addition, ARM 17.30.706(6) specifies that in order to ensure that a proposed activity will not result in degradation, the Department may require monitoring to verify compliance with this subchapter and 75-5-303, MCA.

Ground water monitoring requirements in the previous permit will be maintained due to the following site-specific criteria:

- The depth to the shallow, alluvial aquifer is approximately 13 feet below ground surface (bgs).

- The Gallatin River is approximately 1,000 feet to the east of each (CS-1 and CS-2) system, and hydraulically downgradient from the RVE subdivision property. In addition, this reach of the river is considered to be gaining.
- The geological conditions of the discharge sites consist mostly of coarse sand and gravel alluvium.
- The potential seepage effects into the ground water from the wastewater systems.

The permittee is required to monitor the ground water quality at the ground water monitoring well locations identified on Attachment 1.

The permittee has constructed a shallow ground water monitoring well (MW1A) for Outfall 001. MW1A is 500 feet hydraulically downgradient from the subsurface drainfields (Outfall 001) in a N64°E direction. MW1A is located at the northern corner of the hydraulically downgradient boundary of the standard ground water mixing zone (see Attachment 1 of the Statement of Basis). MW1A is an open-bottom well completion at a total depth of 28 feet in gravel and sand.

The permittee has constructed a shallow ground water monitoring well (MW2A) for Outfall 002. MW2A is 500 feet hydraulically downgradient from the subsurface drainfields (Outfall 002) in a N64°E direction. MW2A is located midway along the hydraulically downgradient boundary of the mixing zone for Outfall 002. MW2A is an open-bottom well completion at a total depth of 20 feet in gravel and brown sand.

These well locations have been determined and approved by the Department to be at the hydraulically downgradient boundary of each of the two standard, 500-foot ground water mixing zones. The parameters to be monitored and the sampling frequency for MW1A and MW2A are given in Table 13.

Table 13. Ground Water Monitoring Parameters for each Monitoring Well (MW1A and MW2A, separately)

Parameter, units	Frequency	Sample Type ⁽¹⁾
Static Water Level (SWL), feet below top of casing	Quarterly	Instantaneous
E-Coli Bacteria, organisms/100 ml	Quarterly	Grab
Nitrate (as N), mg/L	Quarterly	Grab
Chloride, mg/L	Quarterly	Grab
Specific Conductance, umhos/cm	Quarterly	Grab
Total Dissolved Solids, (TDS) mg/L	Quarterly	Grab

(1) See definitions, Part V of the permit.

The monitoring of chloride and specific conductance is used as indicators of potential impacts from the wastewater to the ground water.

Ground water sample collection, preservation and analysis shall be conducted according to ARM 17.30.1007 and “Non-Point Source Water Quality Standard Operating Procedures” (4/1/95) at www.deq.state.mt.us/wqinfo/monitoring/SOP/pdf/11-10.pdf until the permit is issued. No later than 60 days from the date of permit issuance, the permittee shall develop and maintain onsite a site specific Standard Operating Procedure (SOP) manual and a Sampling and Analysis Plan (SAP) for monitoring and sampling the ground water monitoring well(s).

E. Corrective Action – Ground Water trigger Values

The ground water trigger values and water quality standards for monitoring wells MW1A and MW2A are listed in Table 14.

Table 14. Ground Water Trigger Values for Monitoring Wells MW1A and MW2A, separately

Parameter, units	Trigger Values
E-Coli Bacteria, organisms/100 ml	Equal to or greater than 1
Nitrate (as N), mg/L	7.5

An exceedance of a trigger value for either E-coli bacteria or nitrate (as N) will require a resample be collected from the monitoring well within 72 hours of the laboratory notification of the analytical results from the scheduled sampling event. Corrective action will need to be implemented should the analytical result(s) from the re-sample verify the exceedance(s).

Ground water corrective action could involve but not be limited to, one or more of the following measures based on the nature and extent of the potential impacts to the ground water quality.

- Identification of the probable cause and extent of the ground water quality changes.
- Installation of additional ground water monitoring wells, including an upgradient well.
- Increased sampling (frequency and/or constituents).
- Increase the efficiency of the wastewater treatment system.
- Reduce the amount of nutrients or other parameters discharged into the ground water.
- Addition of disinfection to the effluent prior to discharge, if e-coli bacteria compliance limit was exceeded.
- Supply drinking water to hydraulically downgradient residences/business.

These requirements are enumerated in Part I. Special Conditions, Section D of the permit.

XI. NONDEGRADATION SIGNIFICANCE DETERMINATION

The Department has determined in the original statement of basis that this discharge is nonsignificant and there will be no degradation (DEQ, Regensberger,1999) of state waters for the purpose of the Montana Nondegradation Policy [75-5-303, MCA; ARM 17.30.1001(4)]. The permit renewal is for the existing source. The applicable water quality standards for Class I ground water are summarized in Table 4. The effluent limits for TN and TP are based on compliance with water quality standards. The proposed discharge will not exceed the water quality standard for nitrate (as N) of 7.5 mg/L at the hydraulically downgradient boundary of the standard 500-foot ground water mixing zones for Outfall 001 and Outfall 002.

XI. INFORMATION SOURCES

In the development of the effluent limitations, monitoring requirements and special conditions for the draft permit, the following information sources were used to establish the basis of the draft permit and are hereby referenced:

ARM Title 17, Chapter 30, Sub-chapter 5 - Mixing Zones in Surface and Ground Water, September 1999.

ARM Title 17, Chapter 30, Sub-chapter 7 - Nondegradation of Water Quality, March 2000.

ARM Title 17, Chapter 30, Sub-chapter 10 - Montana Ground Water Pollution Control System (MGWPCS), March 2002.

C & H Engineering and Surveying, Inc., supplemental information correspondence with associated data 10/11/04.

Cherry, J.A. and Freeze, R. A., 1979, *Groundwater*. Prentice-Hall Inc., Englewood Cliffs, J.J. Chapter 2, pages 26-29.

DEQ, Tim Byron, Original SOB and EA, October 27, 1999.

DEQ Circular 4, 2004.

DEQ Circular 7 – Montana Numeric Water Quality Standards, February 2006.

DEQ, Memo-Regensberger, “Revised Modification of Phosphorous Concentration for Domestic Sewage in Nondegradation Reviews,” October 29, 1998.

DEQ, “Nitrate Sensitivity Analysis Input Data”, 1994.

DEQ, Regensberger, Eric, EQ#98-2631 “Significance Determination Checklist” and Approval Memo, 11/12/98, and the “Revised Memo-Nondegradation Comments” with Approval 4/9/99.

Environmental Protection Agency, Rev September 2000. U.S. EPA NPDES Permit Writers’ Course, Helena, Montana September, 2000, Workbook EPA 833-B-97-001.

Environmental Protection Agency, February 2002. *Design Manual: Onsite Wastewater Treatment and Disposal System*. EPA 625/R-00/008, p. 3-29 (Table 3-19).

Montagne, John, “Surficial Geology Map” 1976.

XIII. Attachments

1. Site Map for CS-1 and CS-2 with Mixing Zones Delineated and Locations of the Ground Water Monitoring Wells

Prepared by: Pat Potts

Date: May 7, 2008



DIRECTION OF GROUNDWATER FLOW
 1" = 100' (1" = 100')